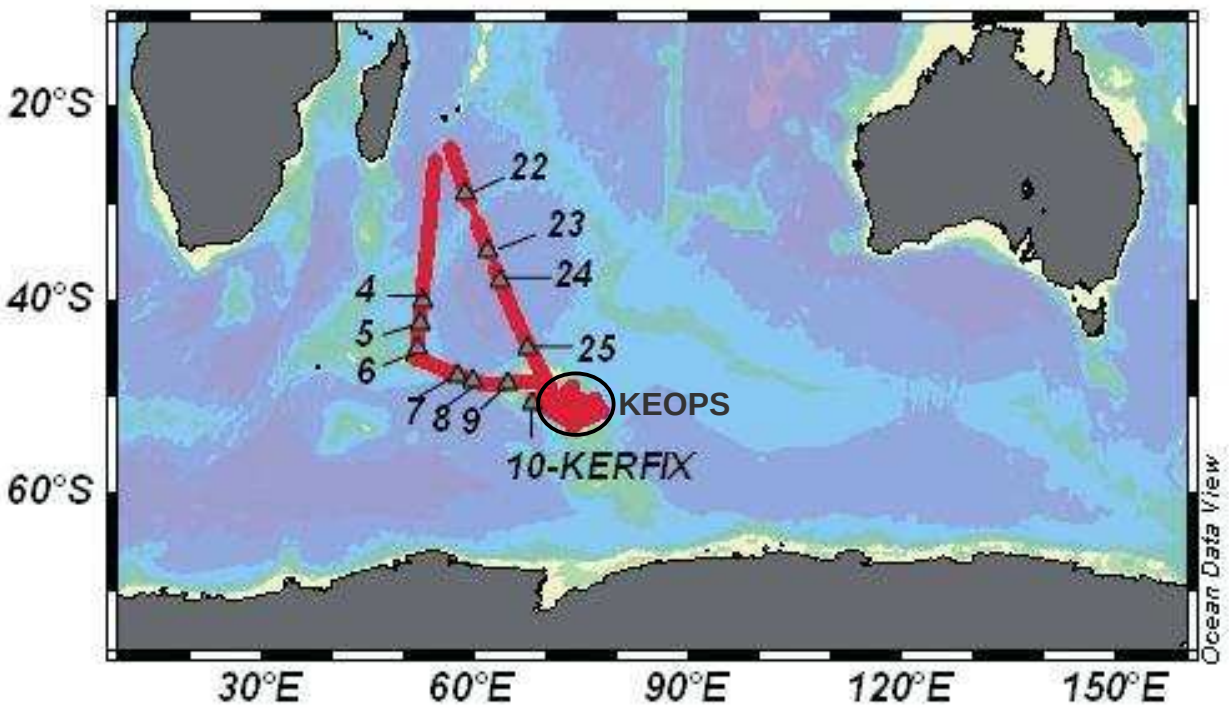
OISO12 cruise

conducted in Jan/Feb 2005

on board *R.V. Marion Dufresne*



Map locating the observations collected during the OISO12 cruise conducted in 2005 (Jan, 11 -Feb, 12). Water column samples were collected at the eleven CTD-Hydro stations indicated by the gray triangles. Also indicated are the surface underway measurements (in red, CO_2 and related parameters).

In addition to the OISO stations shown on the map, water samples were also collected on the Plateau south of Kerguelen in the framwork of the KEOPS project (PI, S. Blain). Visit the KEOPS website for more information : http://www.obs-vlfr.fr/proof/vt/op/ec/keops/keo.htm.

Metadata for water column observations - OISO12

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Cruise Info

Project Name:	Océan Indien Service d'Observation (OISO)
Objectives:	The OISO program, started in 1998, aims at monitoring observations of the CO_2 system and associated properties (hydrology, biogeochemistry) in both sea surface and water column in the Southern Indian Ocean.
Cruise Name :	OISO12
Expocode:	35MF20050111
Region:	South-West Indian Ocean
Spatial Coverage:	20°S-55°S, 50°E-80°E
Temporal Coverage:	2005, Jan, 11 – 2005, Jan, 22
Ports of Call:	Le Port, Reunion Island
Vessel, Country:	Marion Dufresne (IPEV), France

Dataset Info

Submission Date: 2012, April

- Temperature CTD:

  Units : Degree Celsius

  Method: Temperature sensor Sea-Bird SBE3, calibrated in August 2005.

  Quality Control: Temperature data are in good agreement with previous observations collected at the same locations (INDIGO and OISO data).

- Salinity CTD:

  Method: Conductivity sensor Sea-Bird SBE04, calibrated in August 2005.

  Quality Control: A good agreement is obtained between CTD and bottle data at stations 4 to 9 (0.005±0.01). At stations 10 to 25, CTD data were always lower than bottle data by 0.02±0.02. However, no correction was applied because the origin of the offset is unknown.

- Measured Salinity:

  Method: Water samples were collected from the Niskin bottles in 150 ml salinity bottles (Ocean Scientific International Ltd) and properly stored. Measurements were performed at LOCEAN using a Salinometer Guidline AutoSal 8400.

  Standardization: IAPSO standards were used (Ocean Scientific International Ltd).

  Accuracy: ±0.005, based on the analysis of replicate samples.

  Quality Control: Salinity data are in good agreement with previous observations collected at the same locations (INDIGO and OISO data).

- Oxygen CTD

  Units: µmol/kg

  Method: Sea-Bird oxygen sensor. A problem with the sensor was detected at the beginning of the cruise (stations 22 to 25). A different sensor was used for the rest of the cruise (stations 4 to 10).

  Quality Control: CTD data at stations 4 to 10 were corrected following the linear relationship obtained between CTD and bottle data (r^2=0.9996). CTD data at stations 22 to 25 were corrected using multi-linear regressions (O2mes vs. O2ctd, theta, salinity, depth). The results are in good agreement with previous observations collected at the same locations (INDIGO and OISO data).

- Measured Oxygen

Units: µmol/kg

Method: Water samples were collected from the Niskin bottles in calibrated glass bottles (150-200ml). Measurements were performed onboard following Winkler's titration technique (Williams and Jenkinson,1982).

Standardization: Iodate standards were used (Ocean Scientific International Ltd).

Field Replicate: Deep replicate samples were collected from two different Niskin bottles (usually 1000m or bottom). The mean difference between two deep replicates was 0.8±0.8 µmol/kg (n=4).

Accuracy: ±0.8 µmol/kg based on the analysis of deep replicate samples.

Quality Control: Oxygen data are in good agreement with previous observations collected at the same locations (INDIGO and OISO data).

Method References:

Williams, P. J. LeB, and N. W. Jenkinson, 1982. A transportable microprocessor-controlled precise Winkler titration suitable for field station and shipboard use. *Limnol. Oceanogr,. 27*, 576-585.

- Total CO_2 and Alkalinity

Units: µmol/kg

Method: Water samples were collected from the Niskin bottles in 500 ml glass bottles for the simultaneous analysis of total CO_2 and total alkalinity. Measurements were performed onboard following a potentiometric titration method (Edmond, 1970), using an automated system with a closed cell described by Goyet et al. (1991). The equivalence point is determined using a non-linear regression method (D.O.E., 1994).

Standardization: We used Certified Referenced Materials (CRMs), batch #62, #64 and #65, provided by Dr. A. Dickson (SIO, University of California). The precision of the titration system, based on the analysis of CRMs, was ±3.1 µmol/kg for total CO_2 and ±2.5 µmol/kg alkalinity.

Field Replicate: Deep replicate samples were collected from two different Niskin bottles (usually 1000m, 1500m or bottom). The mean difference between two deep replicates was 2.1±2.3 µmol/kg for TCO_2 and 1.4±1.6 µmol/kg for TA (n=5).

Accuracy: ±3 µmol/kg for total CO_2 and ±2.5 µmol/kg for alkalinity based on CRMs and deep replicate samples analyses.

Quality Control: Total CO_2 and alkalinity data are in good agreement with previous observations collected at the same locations (INDIGO and OISO data).

Method References:

D.O.E., 1994. Handbook of methods for analysis of the various parameters of the carbon dioxide system in sea water; version 2, A.G. Dickson and C.Goyet, eds. ORNL/CDIAC-74.

Edmond J. M., 1970. High precision determination of titration of alkalinity and total CO_2 of seawater by potentiometric titration, Deep-Sea Research, 17, 737-750.

Goyet C., C. Beauverger, C. Brunet and A. Poisson, 1991. Distribution of carbon dioxide partial pressure in surface waters of the southwest Indian Ocean, Tellus, 43B, 1-11.

- Silicate, Nitrate and Phosphate

Units: µmol/kg

Method: Water samples were collected from the Niskin bottles were measure directly onboard using an automated system (AA2, Technicon), following the segmented flow method described by Tréguer and Le Corre (75).

Standardization: Nutrients standard solutions (Ocean Scientific International Ltd) were diluted and used as reference samples.

Accuracy: ±0.4 µmol/kg for silicate, ±0.1 µmol/kg for nitrate and ±0.07 µmol/kg for phosphate, based on the analysis of duplicate samples.

Quality Control: Nutrients data are in good agreement with previous observations collected at the same locations (INDIGO and OISO data).

Method References:

Tréguer, P., and P. Le Corre, 1975. Manuel d'analyse des sels nutritifs dans l'eau de mer (utilisation de l'Autoanalyser 2. Technicon), 2nd ed. Univ. Bretagne Occidentale, France, 110 p.

- Isotopic composition: $\delta^{13}C_{DIC}$

Units: ‰ (vs. Vienna-Pee Dee Belemnite)

Method: Water samples were collected from the Niskin bottles in 125 ml glass bottles and poisoned with 1 ml of saturated $HgCl_2$ solution for storage. Measurements were performed at LOCEAN using a dual inlet-isotopic ratio mass spectrometer (SIRA9-VG), following the method described by Racapé et al. (2010), adapted

from Kroopnick (1974). The precision and the reproducibility of this method are ± 0.01‰ and 0.02‰ respectively (Vangriesheim et al., 2009; Racapé et al., 2010).

Standardization: The isotopic composition is expressed in the δ-unit defined by Craig (1957) by comparing the $^{13}C/^{12}C$ ratio of the sample (R) to the $^{13}C/^{12}C$ ratio of a reference material (R*), the Vienna-Pee Dee Belemnite (V-PDB), as follows: $\delta^{13}C_{DIC} = [(R/R^*) -1] \times 1000$.

Accuracy: ± 0.01‰ based on the analysis of replicate samples.

Quality Control: $\delta^{13}C_{DIC}$ data are in good agreement with previous observations collected at the same locations (OISO data).

Method References:

Craig, H. 1957. Isotopic standards for carbon and oxygen and correction factor for mass-spectrometric analysis of carbon dioxide. *Geochimica Cosmochimica Acta, 12*, 133-149.

Kroopnick, P. 1985. The distribution of ^{13}C of ΣCO_2 in the world oceans. *DSR, 32*, 57-84

Racapé, V., C. Lo Monaco, N. Metzl, and C. Pierre, 2010. Summer and winter distribution of $\delta^{13}C_{DIC}$ in surface waters of the South Indian Ocean (20°S-60°S). *Tellus B, 62 (5)*, 660-673, doi: 10.1111/j.1600-0889.2010.00504.x

Vangriesheim, A., Pierre, C., Aminot, A., Metzl, N., Baurand, F. and co-authors. 2009. The influence of Congo river discharges in the surface and deep layers of the Gulf of Guinea. *Deep-Sea Res. II*, doi:10.1016/j.dsr2.2009.04.002.

Additional information:

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Other data: More parameters were measured during the OISO12 cruise: (contact PIs above)

- Water column measurements of $\delta^{18}O_{H2O}$, and chlorophyll-a.
- Underway surface measurements of temperature, salinity, pCO_2 and related parameters.
- Atmospheric pCO_2 and meteorological observations
- Underway Current Profiler (ADCP)
- KEOPS data collected on the Kerguelen Plateau : visit the KEOPS website for more information: http://www.obs-vlfr.fr/proof/vt/op/ec/keops/keo.htm

OISO project URL: http://caraus.ipsl.jussieu.fr/oiso-accueil.html

Note: Website in French, the English version is under construction.